wide-spread calcareous deposit. Ages on ages will be consumed before this deposit can attain the thickness of some of our masses of limestone; but assuredly it will be materially increased during the short span of a human life.

In conclusion, reflecting on all the considerations which have been noticed, I feel my convictions strongly supported that a telegraph cable, if laid down on the orbulo-globigerinous bottom of the Atlantic, will, after the lapse of a few years, become sufficiently covered up to be protected from any ordinary danger.

PRELIMINARY NOTICE OF THE ORGANIC AND INORGANIC OBJECTS OBTAINED FROM THE SOUNDINGS OF H.M.S. "PORCUPINE" OFF THE WEST COAST OF IRELAND,—*By Professor William King, Queen's College, Galway, and Queen's University in Ireland.**

Sufficient time has not elapsed to enable me to make a detailed report on the various objects which the Lords Commissioners of the Admiralty have done me the honour to place in my hands for examination. I trust, however, to have the report prepared for the press in the course of this winter. On the present occasion I purpose giving a summary of the results of my investigations as far as they have been conducted.

The greatest depth at which specimens have been obtained is 1,750 fathoms. The soundings from this and less depths—up to 500 or 600 fathoms—consist essentially of the same kinds of microscopic organisms already made known by Bailey, Huxley, Wallich, and others.

The marvellous profusion of *Foraminifera* and other minute structures, occurring on the bottom of the Atlantic, shows that over a vast portion of the submarine area (averaging about two miles in depth), known as the "telegraph plateau," which apparently stretches uninterruptedly from the mid-west coast of Ireland to Cape Race in Newfoundland, there are being formed calcareous deposits analagous to common limestones. While nearly all the particles of these deposits ear either the testaceous coverings of dead *Foraminifera* or the finely levigated debris of their shells, it is evident that the surface of the deep Atlantic sea-bed is one vast sheet of the same organisms in a living state, whose office it is to clear the waters of the ocean of all the mineral and organic impurities which are ever flowing into them.

Dried specimens of deep sea "ooze" procured from 1,500 to 1,750 fathoms off the west coast of Ireland bear a striking resemblance to the roe of a fish, owing to their containing myriads of *Globigerinæ* and *Orbulinæ*. This circumstance led me to suspect that roe-stone or oolitic limestone, instead of being, as is generally conceived, a concre-

* [The important additions made to this notice since it appeared in our last, have induced us to repeat it here.—ED.]

tionary deposit, is a purely foraminiferous formation. In prosecuting my investigations on this point, although I have failed to detect any well defined specimens of *Globigerinæ* in oolite, I have been rewarded by discovering that it consists essentially of an allied monothalamous genus. Having carefully examined type specimens of Carboniferous, Permian, and Jurassic oolitic limestones, respectively from Edenderry in Kildare, Sunderland in Durham, and the Isle of Portland, I have no hesitation in stating that they consist for the most part of an organism identical with, or allied to, *Orbulina universa.*

It has long been the opinion of geologists that many limestones are of organic origin; but considering that travertine (Rome) and pisolite (Carlsbad) are purely chemical deposits, it is believed that a number of other calcareous rocks—oolites in particular—have been produced by chemical action. It is now evident, however, that the great bulk of our limestones is organic in its origin,—formed immediately by vital action, like orbulo-globigerinous mud and coral reefs, or derived from the disintegration of shells and other invertebrata. Beds of limestone are often spread over several hundred square miles in area, and one or two thousand feet in thickness. What lessons do they teach us when considered in connexion with the orbulo-globigerinous mud of the Atlantic! Animal life is ceaselessly abstracting lime from the ocean. This calcareous matter is derived, by mechanical and chemical processes, from limestone rocks, which, too, were formed by the vital action of successive generations of ancient invertebrata. The organic and inorganic changes, involved in these processes, have been repeated over and over again during the long lapse of time, forming the sum of geological periods: but, looking into the far past which geology discloses to our view, we *must* conceive a period when limestones did not exist,—when life was not created!

It has been seen *how* calcareous rocks have been formed;—the next question for solution is—from *what* have they originated? Shall we say—from primordial or azoic rocks formed previously to the Laurentian period? But no such rocks—is there any evidence for believing—could contain carbonate of lime, if they resembled our granites: they would contain *silicate* of lime averaging about eight per cent. In this case, may not the calcium of the carbonate of lime, forming limestones, have been originally the calcium of the silicate of lime of ante-Laurentian igneous rocks? In North Wales there occur argillaceous and siliceous aqueous deposits (nearly the oldest known to the geologist), collectively measuring from *five to six or more miles* in thickness. They have all the appearance of having been derived, by mechanical and chemical agencies, from the silica and silicate of alumina of previously existing quartzose, felspathic, and other rocks allied to granites. Now there is required for the elaboration of the enormously thick and ancient sedimentary deposits of North Wales, the abrasion and removal of vast masses of previously existing igneous or other rocks. Is it not a fair inference, then, that the silicate of lime (though fractional in quantity compared with its associated constituents) of the latter rock-masses, became converted into, and was sufficient to produce, the carbonate

of lime forming the limestones of our globe? Hypothetically, it may be assumed that the change was effected by atmospheric carbonic acid, aided by concurrent mechanical agencies.

Although perforating mollusks are living at great depths, I do not think that there are any grounds for apprehending that they would bore into a telegraph cable. I am also inclined to believe that there is little chance of a cable getting injured if laid down on foraminiferous bottoms; as in such places, vital and chemical actions appear to be going on so unceasingly and copiously, that a cable thus circumstanced could not but become covered in the course of a few years with organic accumulations.

The survey has been fortunate in bringing to light some interesting facts in microscopic life. It has also made known some species of shells and other animals new to the British Fauna; besides extending our knowledge of the habitats of certain rare species.

Rising not over-suddenly out of the "telegraph plateau" to within 85 fathoms of the surface of the ocean, at the distance of 120 miles from the south coast of Galway, and forming the *most westerly "land-fall"* on the Irish coast, occurs the newly discovered "Porcupine Bank." It consists of siliceous sand and coarsish gravel, the latter chiefly composed of sub-angular pieces of granular quartzite (? metamorphic), granite, chloritic quartz, &c.; along with which occur considerable quantities of the debris of Nullipores, shells, and other organisms. The larger rock-pieces, some of which are three or four inches in diameter, have often adhering to them fresh specimens of *Truncatulina* and various genera of *Bryozoa;* occasionally they bear specimens of *Crania anomala:* in most cases, the living objects are attached only to the sides, or upper surface of the stones, which shows that the water at the comparatively inconsiderable depth where they live is not much affected by storms and other disturbing agents. A number of fishes was procured by the dredge on this bank in about eighty fathoms water: one a species of *Psetta*, allied to the "whiff;" another a species of *Sebastes*, allied to the Norwegian haddock: both appear to be unrecorded as British.* There were also brought up by the dredge from the depth of a hundred fathoms *Pilidium fulvum*, *Limatula subauriculata*, *Scissurella crispata*, *Leda pygmæa*, *Arca raridentata*, and other shells, numbering in all nearly fifty species; besides sponges, star-fishes, sea-urchins, &c. The same prolific bank yielded in abundance a large hermit crab, specimens of which were tenanting one of the rarest British shells, *Buccinum ovum*. There also came up in the dredge a specimen of *Litorina litorea*, which, notwithstanding its insignificance, requires to be mentioned. The specimen is an adult one; and, though broken, it has a fresh appearance, and retains interiorly its characteristic polish. How has this shell, which only lives between ordinary tide-marks, and feeds on the *Fucus* peculiar to this tract, got into eighty or ninety fathoms

* Specimens of a pipe fish were captured on the surface of the Atlantic 200 miles West of Galway. It appears to be a species undescribed as British.

water, and at the distance of 120 miles from the shore? It may have been swallowed by a cod or some other fish, and carried thither; it may have got entangled in the roots of a seaweed, which afterwards floated out into deep water; or it may have been taken out there by some vessel, and swept overboard.

At the depth of 340 fathoms the sounding machine brought up *orbulo-globigerinous* mud containing (? fossil) specimens of a *Pecten*, an *Arca*, and a *Pectunculus*, which appear to be new to the British seas; also specimens of *Trochus millegranus* in the same condition. A perfectly fresh specimen of a *Cochlodesma*, hitherto unrecorded as British, was brought up from the depth of a thousand fathoms, and at the distance of a hundred miles west of Cape Clear. But the most unexpected fact in this record of deep-sea life is my finding a slightly broken, yet fresh, specimen of the upper valve of a *Discina (Orbicula)* in mud from 1,240 fathoms, taken in N. lat. 52° 8′, W. long. 15° 30′, on the eastern side of the great three-miles-deep submarine valley which runs from the Cape Verd Islands, on the coast of Africa, up to Kerry, or further north, where it rises into the two-miles-deep "telegraph plateau."* Fragments of a branching coral *(Caryophyllia)* and a large-spined sea-urchin have also occurred to me from other parts of the *Irish-Atlantic sea bed.*

Too much credit cannot be awarded to Mr. Hoskyn and the officers of the *Porcupine* for the zeal which they displayed in collecting and preserving the various objects I have noticed. Their labours, it is well known, were frequently conducted under the most adverse circumstances, and during a singular succession of unfavourable weather. Nevertheless, the results of the survey, both as regards Geology and Natural History, are highly valuable.

Belmont, near Galway,

Voyage of H.M.S. "Cyclops:"—The Red Sea.

Captain W. J. S. Pullen.

(Continued from page 546.)

As I had decided on running the first series of lines along the Arabian shore, and into Jeddah, for the purpose of coaling from a supply that had been landed there from a damaged ship, it soon became known from the Vice Consul,-consequently a day or two before I started an application was made for M. Eveillard for a passage to Jeddah for himself and family, consisting of wife and daughter, with a female servant, and Janissary.

To this request I assented pointing out at the same time that the passage would not be so rapid as they might wish, as the duties of the

* Vide *Maury's Physical Geography of the Sea*, plate xi.